

WHAT IS CLAIMED IS:

1           1. A catheter assembly comprising:  
2           a hollow sheath having a proximal portion and a tip;  
3           an elongate operative element slidably and rotatably  
4 housed within the sheath, the operative element comprising a  
5 distal end and a proximal end;  
6           the elongate operative element comprising a  
7 relatively stiff, self-supporting initial section at the  
8 proximal end thereof; and  
9           a combined connector secured to the proximal end of  
10 the operative element, said combined connector comprising a  
11 data/information connector and a mechanical connector.

1           2. The catheter assembly according to claim 1  
2 wherein said data/information connector comprises an  
3 electrical connector.

1           3. The catheter assembly according to claim 1  
2 wherein said mechanical connector comprises a rotary drive  
3 connector.

1           4. The catheter assembly according to claim 3  
2 wherein said rotary drive connector comprises an axially- and  
3 circumferentially-extending drive surface.

1           5. The catheter assembly according to claim 1  
2 wherein said combined connector comprises a rotary alignment  
3 surface.

1           6. The catheter assembly according to claim 1  
2 wherein said elongate operative element comprises an imaging  
3 cable having an image element at said distal end thereof.

1           7. The catheter assembly according to claim 1  
2 wherein said initial section comprises a metal tube.

1           8. The catheter assembly according to claim 1  
2 further comprising a fluid seal between said proximal portion  
3 of said sheath and the initial section of the elongate  
4 operative element.

1           9. The catheter system according to claim 1  
2 wherein said elongate operative element comprises a flexible  
3 imaging core and a relatively stiff tube at the proximal end  
4 thereof to create a relatively stiff, self-supporting initial  
5 section of the elongate operative element at the proximal end  
6 thereof.

1           10. A combined connector assembly, for use with a  
2 catheter system of the type including a rotary and  
3 longitudinal driver and a catheter assembly having an outer  
4 sheath and an inner catheter rotatably and slidably housed  
5 within the outer sheath, the combined connector assembly  
6 comprising:

7           a first combined connector connected to and movable  
8 with the driver and a second combined connector connected to  
9 and movable with the inner catheter; and

10           said first and second combined connectors being  
11 blind matable connectors constructed to (1) provide a  
12 data/information connection between the driver and the inner  
13 catheter when connected, and (2) cause the second combined  
14 connector and inner catheter therewith to rotate and move  
15 longitudinally according to the rotation and longitudinal  
16 movement of the driver.

1           11. The connector assembly according to claim 10  
2 wherein the first and second combined connectors comprise:  
3           socket and plug electrical connectors; and  
4           first and second rotary drive connectors  
5           with axially- and circumferentially-extending drive surfaces.

1           12. The connector assembly according to claim 11  
2 wherein said socket and plug electrical connectors are located  
3 coaxial with said first and second rotary drive connectors.

1           13. The connector assembly according to claim 10  
2 wherein said first and second combined connectors comprise  
3 rotary alignment surfaces which engage when said connectors  
4 are connected so to ensure proper rotary alignment of said  
5 connectors when connected.

1           14. A catheter system comprising:  
2           a drive assembly comprising:  
3               a body including a proximal portion mount;  
4               a drive chassis movably mounted to the body for  
5 movement along a longitudinal path;  
6               a longitudinal mover operably coupling the  
7 drive chassis and the body for selective movement of the drive  
8 chassis along the longitudinal path; and  
9               a rotary driver mounted to the drive chassis  
10 and moveable therewith along the longitudinal path, the rotary  
11 driver comprising a rotary drive motor and a first combined  
12 connector rotatable by the rotary drive motor and movable  
13 along the longitudinal path between first and second  
14 positions; and  
15           a catheter assembly comprising:  
16               a hollow sheath having a proximal portion and a  
17 tip, said proximal portion of the sheath being removably  
18 secured to the proximal portion mount of the body;  
19               an elongate operative element slidably and  
20 rotatably housed within the sheath, the operative element  
21 comprising a distal end and a proximal end; and  
22               a second combined connector secured to the proximal  
23 end of the operative element; and  
24           said first and second combined connectors being  
25 blind matable connectors constructed to (1) provide a  
26 data/information connection between the operative element and  
27 the rotary driver when connected, and (2) cause the second  
28 combined connector and operative element therewith to rotate  
29 and move longitudinally according to the rotation and  
30 longitudinal movement of the first combined connector.

1           15. The catheter system according to claim 14  
2 wherein the body and the drive chassis comprise a linear  
3 bearing, the linear bearing comprising a linear bearing track  
4 mounted to the body, the linear bearing track lying parallel  
5 to said longitudinal path.

1           16. The catheter system according to claim 14  
2 wherein the longitudinal mover comprises:  
3           a drive screw rotatably mounted to the body;  
4           a drive screw motor mounted to the body and  
5 drivingly coupled to the drive screw; and  
6           a drive screw clamp mounted to the drive chassis for  
7 movement between drive screw engaged and disengaged positions  
8 so that said chassis is moved along the longitudinal path when  
9 the drive screw clamp is in the drive screw engaged position  
10 and the drive screw motor is rotating the drive screw.

1           17. The catheter system according to claim 16  
2 wherein the drive screw is housed within the body.

1           18. The catheter system according to claim 16  
2 wherein the drive screw clamp is a manually-operated clamp.

1           19. The catheter system according to claim 14  
2 wherein the first and second combined connectors comprise:  
3           socket and plug electrical connectors; and  
4           first and second rotary drive connectors  
5 with axially- and circumferentially-extending drive surfaces.

1           20. The catheter system according to claim 19  
2 wherein said socket and plug electrical connectors are located  
3 coaxial with said first and second rotary drive connectors.

1           21. The catheter system according to claim 14  
2 wherein said first and second combined connectors comprise  
3 rotary alignment surfaces which engage when said connectors  
4 are connected so to ensure proper rotary alignment of said  
5 connectors when connected.

1           22. The catheter system according to claim 14  
2 wherein said proximal portion of said sheath comprises a fluid  
3 port.

1           23. The catheter system according to claim 14  
2 wherein the elongate operative element comprises a relatively  
3 stiff, self-supporting initial section at the proximal end  
4 thereof.

1           24. A method for operating a catheter system  
2 comprising:

3           selecting a catheter assembly, said catheter  
4 assembly comprising:

5                 a hollow sheath having a proximal portion and a  
6 tip;

7                 an elongate operative element slidably and  
8 rotatably housed within the sheath, the operative element  
9 comprising a distal end and a proximal end; and

10                a second combined connector secured to the  
11 proximal end of the operative element;

12                mounting said catheter assembly to a drive assembly,  
13 the drive assembly comprising a rotatable and translatable  
14 first combined connector;

15                connecting the second combined connector of the  
16 catheter assembly to the first combined connector;

17                securing the proximal portion of the sheath to a  
18 proximal portion mount of the drive assembly;

19                selectively rotating the first combined connector  
20 which in turn rotates the second combined connector which in  
21 turn rotates the elongate operative element within the sheath;  
22 and

23                selectively longitudinally translating the operative  
24 element within the sheath by moving the first combined  
25 connector along a longitudinal path between an extended  
26 position and a retracted position.

1           25. The method according to claim 24 wherein the  
2 catheter assembly mounting step is carried out by positioning  
3 the first combined connector at the extended position, the  
4 first and second combined connectors being connected to one  
5 another while the proximal portion of the sheath and the  
6 proximal portion mount are being secured to one another.

1           26. The method according to claim 24 wherein the  
2 connecting step is carried out by moving the proximal end of  
3 the catheter assembly in a straight line causing the  
4 frictional coupling of the first and second combined  
5 connectors.

1           27. The method according to claim 26 wherein the  
2 proximal end moving step causes the first and second combined  
3 connectors to be frictionally coupled.

1           28. The method according to claim 24 wherein the  
2 selectively rotating step is carried out using a motor.

1           29. The method according to claim 24 wherein the  
2 selectively longitudinally translating step is carried out  
3 using a motor.

1           30. The method according to claim 24 wherein the  
2 selectively longitudinally translating step can be carried out  
3 manually or using a motor.

1           31. The method according to claim 30 wherein when  
2 the selectively longitudinally translating step is carried out  
3 manually, a user manually disengages a drive chassis of the  
4 drive assembly from a drive screw of the drive assembly to  
5 permit said drive chassis, and the first combined connector  
6 therewith, to be freely manually translated along a  
7 longitudinal path.

1           32. The method according to claim 24 wherein said  
2 positioning step is carried out manually, a user manually  
3 disengages a drive chassis of the drive assembly from a drive  
4 screw of the drive assembly to permit said drive chassis, and  
5 the first combined connector therewith, to be freely manually  
6 translated along a longitudinal path.

1           33. A method for preparing a catheter system for  
2 use, comprising the following steps:

3           selecting a catheter assembly, said catheter  
4 assembly comprising:

5                 a hollow sheath having a proximal portion and a  
6 tip;

7                 an elongate operative element slidably and  
8 rotatably housed within the sheath, the operative element  
9 comprising a distal end and a proximal end; and

10                a second combined connector secured to the  
11 proximal end of the operative element; and

12                mounting said catheter assembly to a drive assembly  
13 by:

14                 positioning a rotatable and translatable first  
15 combined connector at an extended position; and

16                 connecting the second combined connector of the  
17 catheter assembly to the first combined connector while  
18 securing the proximal portion of the sheath to a proximal  
19 portion mount of the drive assembly so that rotating the first  
20 combined connector rotates the second combined connector which  
21 in turn rotates the elongate operative element within the  
22 sheath, and moving the first combined connector along a  
23 longitudinal path between said extended position and a  
24 retracted position translates the second combined connector  
25 which in turn translates the operative element within the  
26 sheath.